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Publication number: **0 406 202 A2**

**EUROPEAN PATENT APPLICATION**

Application number: 90850253.7

Int. Cl.<sup>5</sup>: B21G 3/12, B21G 3/28

Date of filing: 26.06.90

Priority: 30.06.89 SE 8902386

Date of publication of application:  
02.01.91 Bulletin 91/01

Designated Contracting States:  
AT CH DE DK GB LI NL

Applicant: HAMEX HARDMETALLVERKTYG AB  
P.O.Box 1117  
S-581 11 Linköping(SE)

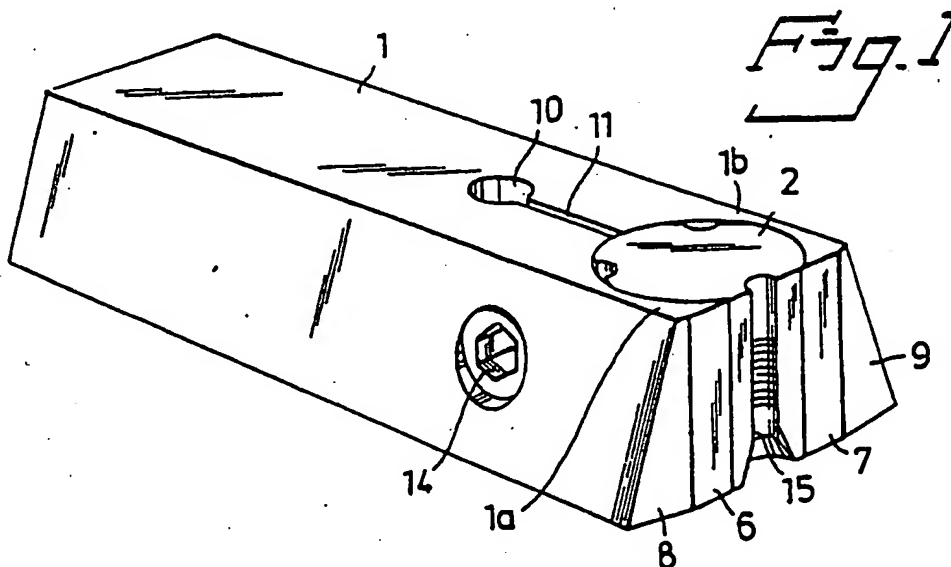
Inventor: Hurtig, Lars  
Vretagården  
S-590 61 Vreta Kloster(SE)

Representative: Westerlund, Christer et al  
L.A. Groth & Co Patentbyrå AB  
Västmannagatan 43n43  
S-113 25 Stockholm(SE)

**A clamping device for making nails.**

A clamping device for making nails, comprising a die holder (1) mountable in a nail-making machine and a hard-metal die (2) disposed in the die holder, the hard-metal die having a clamping part (15) which together with a corresponding clamping part of a complementary clamping device holds a nail during

the manufacture thereof. The die is provided with at least two spaced apart clamping parts (15) and is detachably inserted and lockable in at least two different positions in a recess (3) formed in the die holder (1).



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# TECHNICAL FIELD

The present invention relates to a clamping device for making nails, comprising a die holder which is mountable in a nail-making machine and a hard-metal die disposed in said die holder, the hard-metal die having a clamping part which together with a corresponding clamping part of a complementary clamping device holds a nail during the manufacture thereof.

## Prior art

Clamping devices of the above-mentioned kind are previously known. They are provided in pairs in a nail-making machine and hold the nail while a head is being formed and the nail is cut off from a metal wire. The known clamping devices comprise a die holder provided with a recess, in which a hard metal die has been mounted by soldering. The reason why the entire clamping device is not made of hard metal is the high material costs. Although the clamping parts are made of hard metal they wear out after some time of use, and the whole clamping device will then be discarded and replaced by a new one, since the cost of removing the die and mounting a new die in the die holder will not be less than that of replacing the whole clamping device and since the tensile properties of the die holder become impaired.

## Description of the invention

It is an object of the present invention to improve clamping devices of the above-mentioned kind and to provide a clamping device in which the die is easily replaceable by a new die in the same die holder, and in which the die is held in the recess of the die holder without being soldered thereto and in which a plurality of clamping parts of the same kind, or a plurality of clamping parts of different kinds adapted to different nail shapes and/or dimensions, can be formed on the die and brought into contact with the complementary clamping device of the pair of clamping devices, thereby extending the life of the die and the field of applications and reducing the number of dies to be manufactured and kept in stock. Further, time will be saved, since it is easier to exchange the die in the existing die holder when, later on, the clamping device is mounted in the machine, than it would be to exchange the entire clamping device.

This object is accomplished by providing the clamping device according to the invention with the features stated in the characterizing portions of the

claims.

## Description of the figures

Figure 1 is a perspective view of a clamping device according to the invention, seen obliquely from above and from the front,

Figure 2 is a perspective view of a die holder included in the clamping device according to Figure 1, seen obliquely from below and from the rear,

Figure 3 is a perspective view of a hard-metal die included in the clamping device according to Figure 1, seen obliquely from below and from the rear, and

Figure 4 is a top plan view of two complementary clamping devices according to Figure 1.

## Preferred embodiment

The clamping devices shown in the figures are used in pairs, as shown in Figure 4, in a nail-making machine to clamp a wire while a head is being formed at the open end of the wire by means of a punch and the wire is cut to the length of the nail by cutting tools working in pairs.

Each of the two clamping devices, which are of essentially the same shape, comprises a die holder 1 intended to be mounted in the nail-making machine, and a hard-metal die 2, which is detachably mounted in the die holder.

The die holder 1, which is made of steel, has a parallel-trapezoidal cross section and is provided with a recess in the form of a drilled hole 3 at one end. The circumference of the drilled hole 3 is smaller than the circumference of a circle, so that the drilled hole opens at said end along two parallel edges 4 and 5, the distance between which is considerably smaller than and preferably around two fifths of the diameter of the drilled hole. The edges 4, 5 delimit parallel surfaces 6 and 7 on the die holder 1, the parallel surfaces connecting on to bevels 8 and 9. A smaller drilled hole 10 parallel with the drilled hole 3 but of a smaller diameter than the drilled hole is connected with the drilled hole 3 by means of a through slot 11. A through hole 12 intersects the slot 11 and is provided, on one side of the slot, with a thread 13. A bolt 14 is inserted in the drilled hole 12 and presses the two tool portions 1a and 1b on both sides of the slot against each other on tightening, since said portions are flexible.

The die 2 is substantially cylindrical and has a diameter which is slightly smaller than the diameter

of the drilled hole 3. Its length corresponds to the length of the drilled hole 3. On its mantle surface, the die 2 is formed with three plane surfaces in which clamping parts in the form of clamping grooves 15 are provided. Each clamping groove comprises a semi-cylindrical portion 16 with a plurality of annular slots 17, and a semi-frustoconical portion 18. All the clamping grooves 15 can be identical or of different dimensions adapted to different nail sizes and shapes. The clamping grooves 15 can be less or more than three in number and are suitably evenly distributed over the circumference of the die.

The die 2 fits the drilled hole 3 into which it is inserted in the way shown in Figures 1 and 4 and is turnable 360° within the drilled hole. The die is lockable in any position in the drilled hole by tightening the bolt 14 which presses the portions 1a and 1b against each other.

Figure 4 shows two clamping devices, at least one of which is slidable along its longitudinal axis towards and away from the other clamping device. In the positions of the clamping devices according to Figure 4, two identical clamping parts 15 on the two dies 2 bearing on each other form a circular groove 19, the portions 16 of which are intended to clamp a wire (not shown) from which a nail is to be made, and the portions 18 of which are intended to guide the wire fed to the clamping devices. At the portion of each clamping part 15 furthest away from the portion 18, a nail head is intended to be formed from the wire at the open end thereof when a punch (not shown) is struck onto said end in the longitudinal direction of the wire.

While there has been described above and shown on the drawings an embodiment of the invention, it will be appreciated that the invention is not limited to this embodiment but only by what is stated in the claims.

### Claims

1 A clamping device for making nails, comprising a die holder (1) mountable in a nail-making machine and a hard-metal die (2) disposed in said die holder, the hard-metal die having a clamping part (15) which together with a corresponding clamping part of a complementary clamping device holds a nail during the manufacture thereof, the die (2) being provided with at least two spaced apart clamping parts (15) and being detachably inserted and lockable in at least two different positions in a recess (3) formed in the die holder (1), characterized in that the recess (3) is of partially circular-cylindrical shape and that a non-circular portion of the recess (at 4, 5) opens at an end of the die holder (1) and delimits said clamping part (15) of

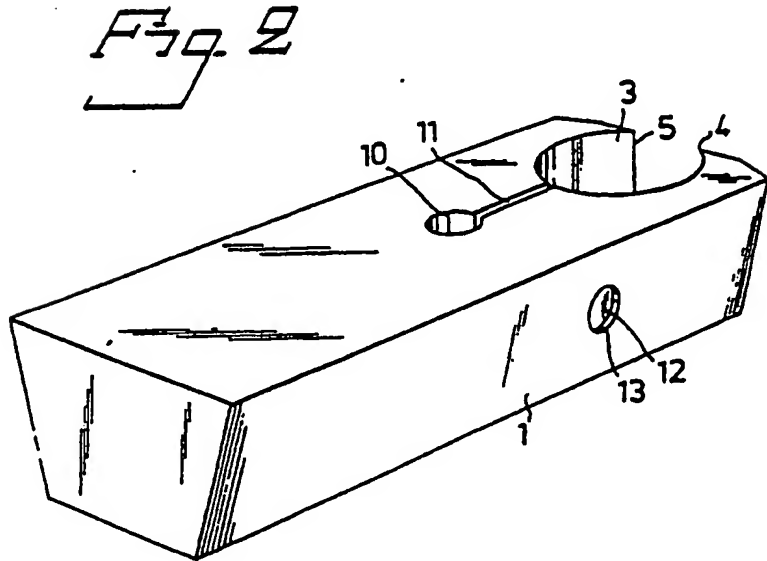
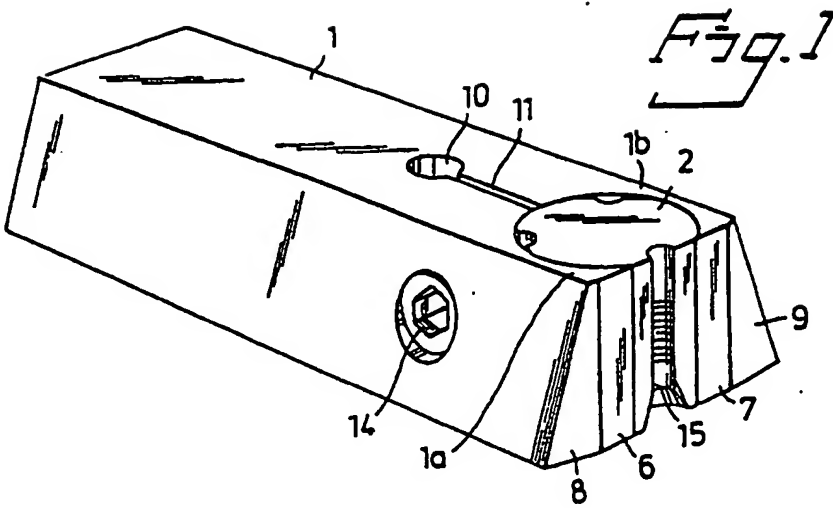
the die (2), the width of the non-circular portion transversely to the longitudinal axis of the recess being smaller than the diameter of the recess.

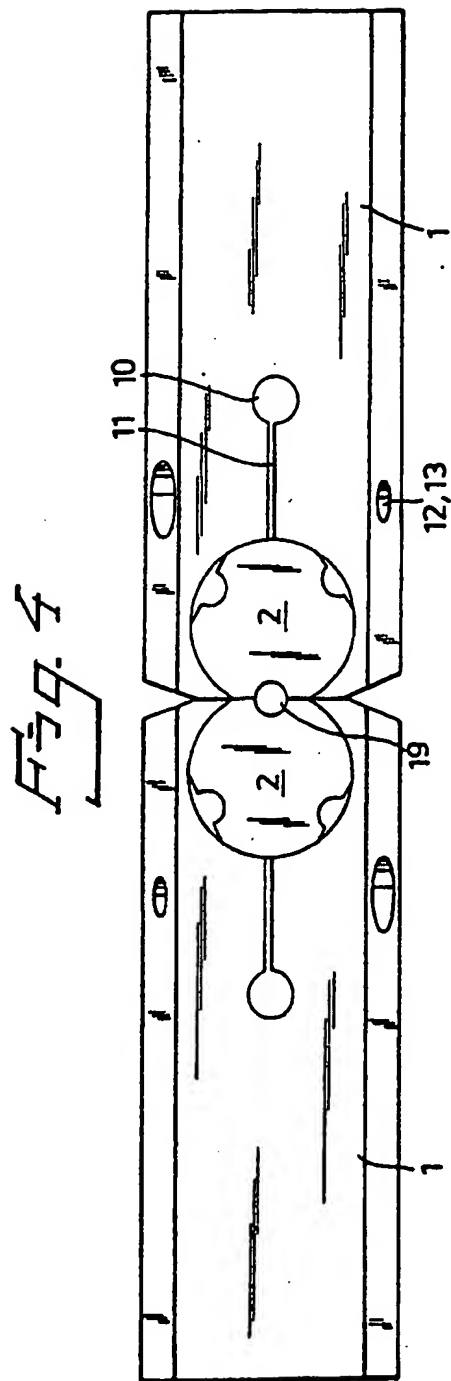
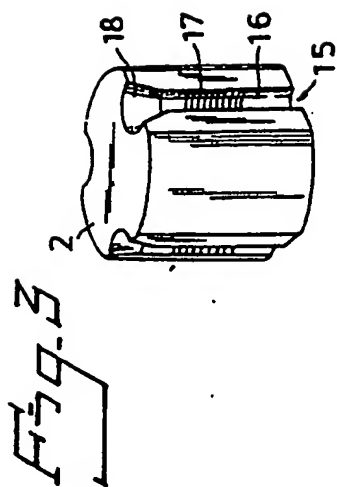
2 A clamping device according to claim 1, characterized in that the die (2) is substantially circular-cylindrical and has a diameter which is slightly smaller than the diameter of the recess (3), the die preferably being turnable 360° in the recess (3).

3 A clamping device according to claim 1 or 2, characterized in that the recess (3) extends as a drilled hole through the die holder (1) and allows removal of the die (2) from the recess only in the longitudinal direction of the drilled hole.

4 A clamping device for making nails, comprising a die holder (1) mountable in a nail-making machine and a hard-metal die (2) disposed in said die holder, the hard-metal die having a clamping part (15) which together with a corresponding clamping part of a complementary clamping device holds a nail during the manufacture thereof, the die being provided with at least two spaced apart clamping parts and being detachably inserted and lockable in at least two different positions in a recess (3) formed in the die holder, characterized in that the die (2) is lockable in the recess (3) by compressing flexible portions (1a, 1b) of the die holder (1) surrounding the die.

5 A clamping device according to claim 4, characterized in that the flexible portions (1a, 1b) are separated by a slot (11) in the die holder (1) and are compressible by means of at least one bolt (14) or the like acting on the flexible portions.





side against an end side of the recess, which wedge comprises a hole, through which hole a bolt is connected to the tool holder, and that the tool is fastened by tightening the bolt against the wedge.

[0011] Hereby it is obtained, that the tool is compressed between the two opposite sides of the recess, such that compressive stresses are introduced in the tool. Due to the wedge-shape of the two sides, the pressure applied to the back side is amplified several times, whereby the compressive stresses reach a high level. Also the force from the bolt is amplified, whereby the compressive stresses may be further increased. Another advantage is that the tool may be replaced without having to disconnect the tool holder from the machine, since the tool and the fastening means may all be reached from the same and accessible side.

[0012] The two opposite sides may further be formed with a wedge-shape relative to the bottom side of the recess, which wedge-shape is narrowing away from said bottom side, and the two corresponding sides in the recess in the tool holder be placed in substantially the same wedge-shape. Thereby it may be obtained, that harmful effects from the shear as well as tensile stresses near the contact portion of the tool from the making of the nail/screw head may be reduced. A prestressed state of compression will also in this respect reduce the maximum tensile stresses and improve life span of the tool.

[0013] The angle of the wedge-shape narrowing towards the front side of the tool may in a preferred embodiment be between 0.5 and 45 degrees.

[0014] In a more preferred embodiment, the angle may be between 1 and 15 degrees.

[0015] In a further preferred embodiment, the angle of the wedge-shape narrowing away from the bottom side of the recess may be between 1 and 30 degrees.

[0016] The new and inventive aspects of the tool according to the invention comprise, that the tool comprises two opposite sides forming a wedge-shape, which is narrowing towards the front side of the tool, and that the tool is configured for fastening in a tool holder comprising a recess adapted for receiving the tool and fastening means for fastening the tool by application and maintenance of pressure on the tool, in a way such that the two opposite sides may be pre-stressed in the recess. Hereby the tool may be fastened in a tool holder such that tensile stresses in the tool are reduced and increased life span is obtained.

[0017] The new and inventive aspects of the tool holder according to the invention comprise, that the tool holder is adapted for receiving and fastening a wedge-shaped tool for use in cold forming of metal wire into nails, screws, etc., which tool holder comprises a recess shaped for receiving the tool and wherein the tool is to be placed, and that the recess in the tool holder comprises two sides forming a wedge-shape, which is narrowing towards an open end of the recess, and that the tool holder comprises fastening means configured for fastening the tool by application and maintenance of pressure on the tool, in a way such that the tool may be pre-stressed in the recess against the sides. Hereby it is obtained, that the tool holder may receive and fasten a tool, in a way such that the life span of the tool is increased.

[0018] The new and inventive aspects of the use of the tool and tool holder according to the invention comprise, that these are used in a machine or plant in a process for the manufacture of nails, screws and similar items, whereby lost production time is decreased.

[0019] In the following the invention is further explained with the use of drawings, where examples of embodiments are shown.

[0020] FIG. 1 is an exploded view of a tool system

[0021] FIG. 2 is a perspective view of a tool system

[0022] FIG. 3 is a top view of a tool system

[0023] FIG. 4 is a front view of a tool system

[0024] FIG. 5 is a cross sectional view along the line C-C of FIG. 3

[0025] FIG. 6 is a cross sectional view along the line B-B of FIG. 4

[0026] FIG. 7 is a top view of a tool holder

[0027] FIG. 8 is a cross sectional view along the line D-D of FIG. 7

[0028] FIG. 9 is a cross sectional view of a tool holder

[0029] FIG. 10 is a perspective view of a tool

[0030] FIG. 11 is a perspective view of another tool

[0031] FIG. 12 is a top view of a tool

[0032] FIG. 13 is a side view of a tool

[0033] FIG. 14 is a front view of a tool

[0034] FIG. 15 is a front view of another tool

[0035] In FIG. 1 a tool holder 4 with a wedge-shaped recess 8 is shown. A tool 2 is to be placed in the recess 8 and fastened by fastening means 20, which in this example comprise a wedge 24 with a hole 26 and a bolt 28. The bolt 28 is to be engaged with an threaded hole in the bottom of the recess 8 (not shown).

[0036] In FIG. 2-4 a tool 2 is fastened by fastening means 20 in a wedge-shaped recess 8 of a tool holder 4, which wedge-shape is indicated by an angle A.

[0037] The tool comprises a front side 6 shaped for use in cold forming of metal wire into nails, screws or similar products. The tool 2 may be made of a hardened metal alloy. In FIG. 3 an angle A is shown, which angle refers to the wedge-shape of the recess 8. Preferably, the tool 2 is provided with a similar wedge-shape. The fastening means 20 are pressing the tool 2 towards the narrowing end of the recess 8 in order to compress the tool 2 against the recess 8. The fastening means 20, 24, 26, 28 shown in FIGS. 1-3 are for a skilled person easily substituted, e.g. with a bolt through the tool holder 4 in the longitudinal direction, pressing directly on the tool 2, or a hydraulic cylinder built into the holder 4 etc.

[0038] FIG. 5 shows a cross section of a tool 2 placed in a recess 8 in a holder 4. As displayed, the tool 2 and the recess 8 are fitted closely.

[0039] FIG. 6 shows another cross section in a tool 2 and a tool holder 4. Pressure is exerted on a back side 18 of the tool 2 by a wedge 24. The back side 18 is sloped relative to